Deliverable D3.3

Inner and outer tube material developments and corrosion protection systems

WP3

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Dissemination Level

PU	Public	
CO	Confidential, only for members of the consortium (including the Commission Services)	**X**
CI	Classified, as referred to in Commission Decision 2001/844/EC	

Publishable summary

The deliverable 'Inner and outer tube material developments and corrosion protection systems' is a confidential document delivered in the context of Work Package 3, Task T3.3 with regard to coaxial Ground Source Heat Exchanger (GSHE) developments.

Materials have been studied in function of their installation methodologies. Coaxial Ground Source Heat Exchangers can be installed either by drilling a hole first, then inserting the GSHE and grouting the hole or by piling the outer tube of the coaxial GSHE into the ground.

Several thermoplastic based and metal based materials have been investigated for their use as outer tubes of the coaxial GSHE's. Their service life has been estimated in function of their material characteristics, the installation methodology, the operating parameters and underground conditions. In the case of piling, thermoplastics and coated metals cannot be used due to the piling forces into playand the friction with the soil.

In addition, the investment costs per kW extracted have also been defined for the different materials considering a common application case with a heat pump of 5 kW. From this analysis high density polyethylene, crosslinked poly-ethylene and stainless steel 304L have been found to be the materials of choice, having the lowest cost per extracted kW and service lives of at least 50 years. The soil conditions when using stainless steel as outer tube material need to be checked on a case by case basis. If necessary, special alloys or cathodic protection equipment needs to be foreseen to prevent corrosion. Such type of equipment is commercially available.

An insulated inner tube has been developed and will be field tested further down in the project although simulations have shown that efficiency improvements are limited.

Inner tube designs creating swirl in the geothermal fluid have been looked at. One coaxial Ground Source Heat exchangers with this concept is already on the market and others have been tested. Simulations and production cost estimates in the next task will define whether this development is attractive from a cost / benefit perspective.